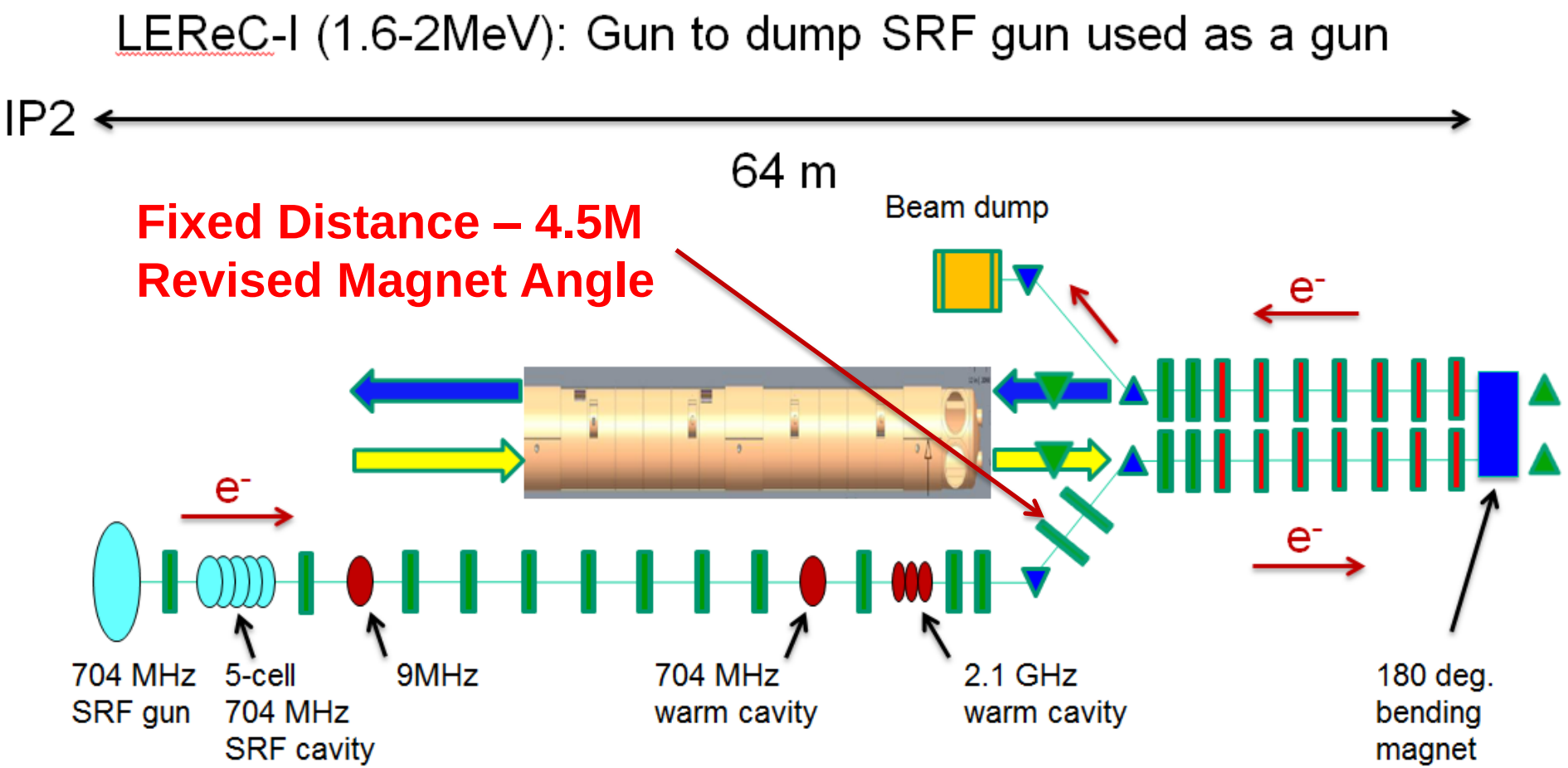
1. Cooling Section:
   - LF Solenoids:
     - At PPM, G. Woods has assigned buyer, SOW will be revised, will get out to bid by 1/9/14 if possible.
   - HF (Matching) Solenoids
     - Corrector magnets will be separate from the solenoids. These will be conventional frame type magnets.
     - No bucking coils in HF solenoids.
     - These solenoids have been finalized by Wuzheng. They have low current density at 76 amps/cm^2, so plan is to design for air cooling
   - 180 deg Dipole
     - Chamber position in magnet is slide-able 6 cm
     - Magnet gap is 4 inches (same as 20deg dipoles)

- Beam Line
  - Magnetic Shielding
    - 2.5 milligauss shielding of beam line required (AF).
    - Mike Mapes asked whether ion pumps need to be shielded – TBD
  - Bellows to have RF Shields 0.003 to 0.005 inch thickness (JT, MM)

- Instrumentation:
  - BPM's
    - These will be small button BPM's as large produce too much wake field from MPF.
    - Instrumentation alignment of electron beams to be 150μm. A 50μm alignment is required (WF)

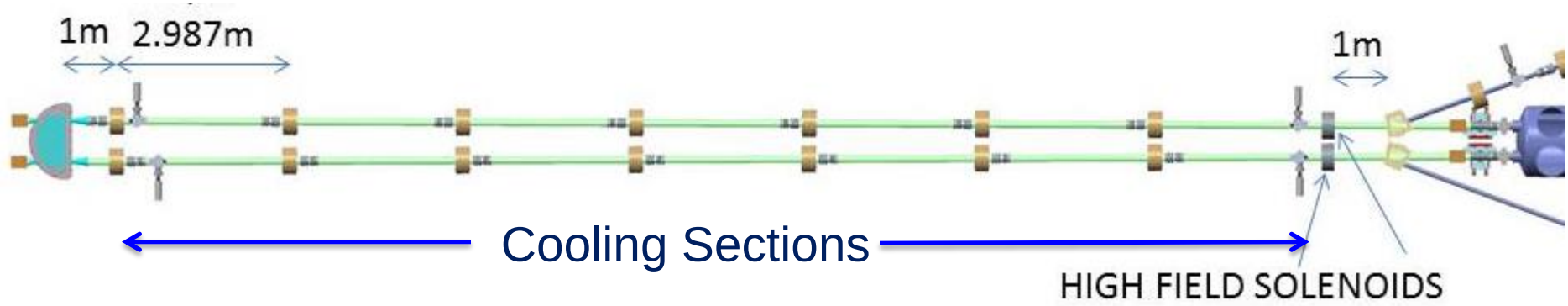
System Design Overview 1.0



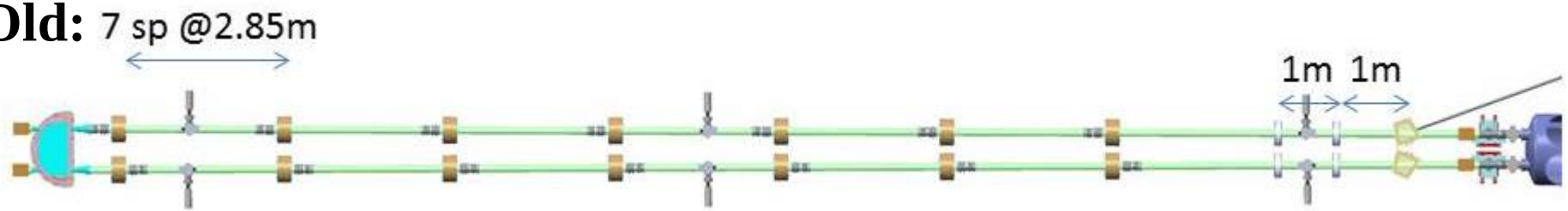
Revised Cooling Sections

Eliminate 2 of 4 high field (matching) solenoids & PS.
Keep 2 high field H & V correctors in matching solenoids (& PS)
Stretch cooling sections: same number of low field (compensating) solenoids, correctors, PS's, and BPM's.

New:

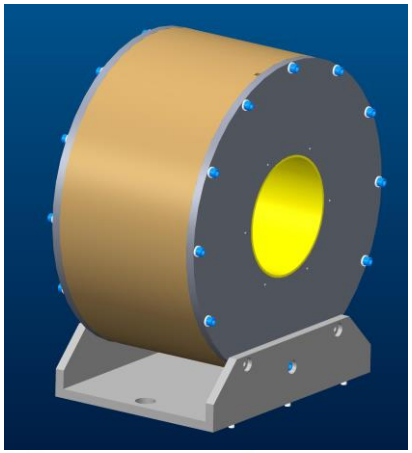


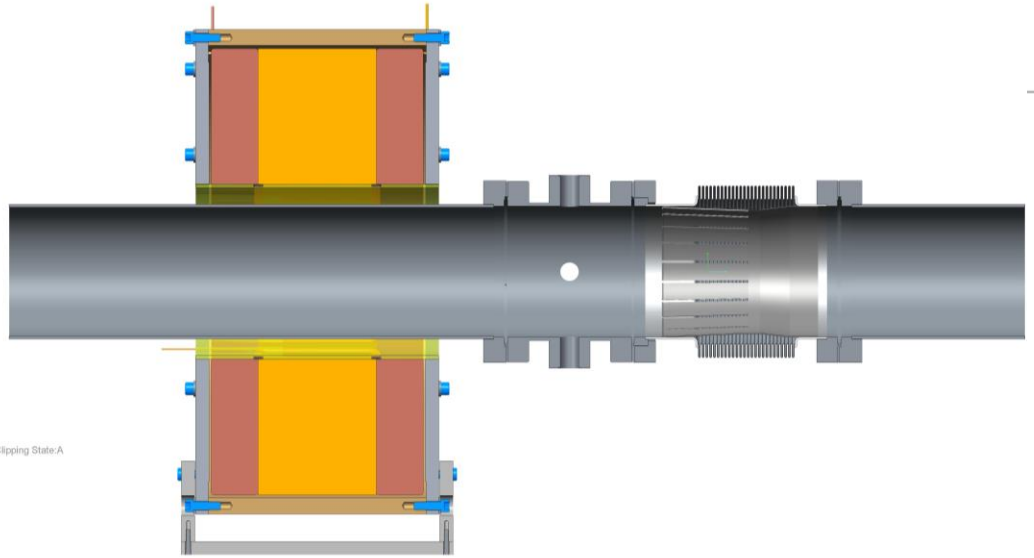
Old:

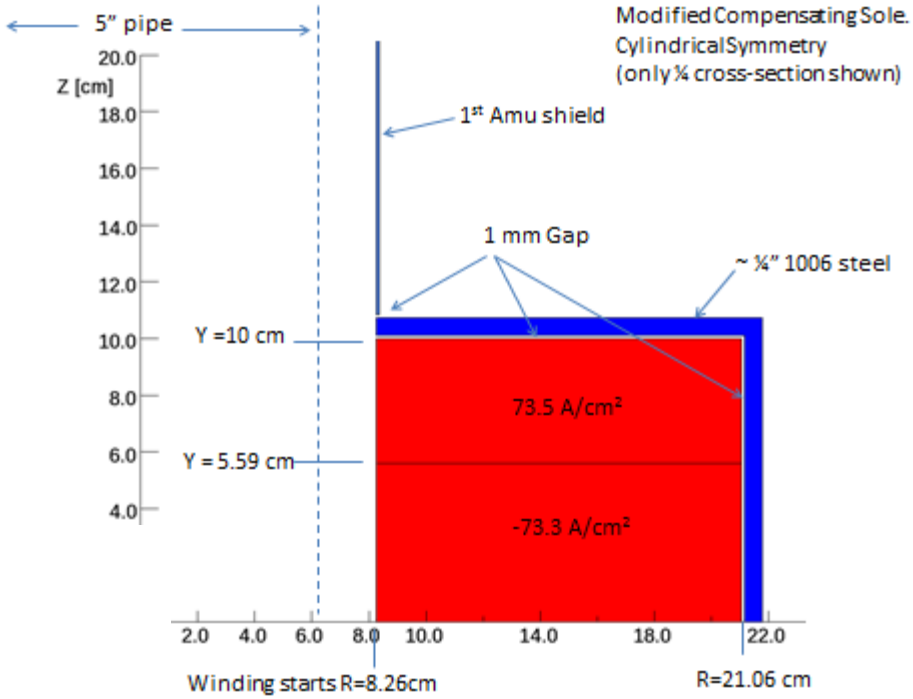


Compensating Solenoids

Requisition Complete





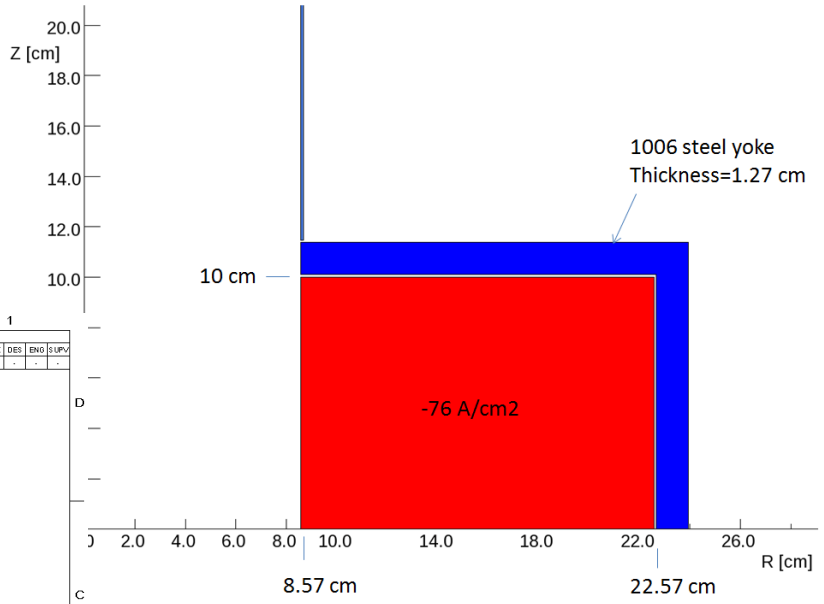


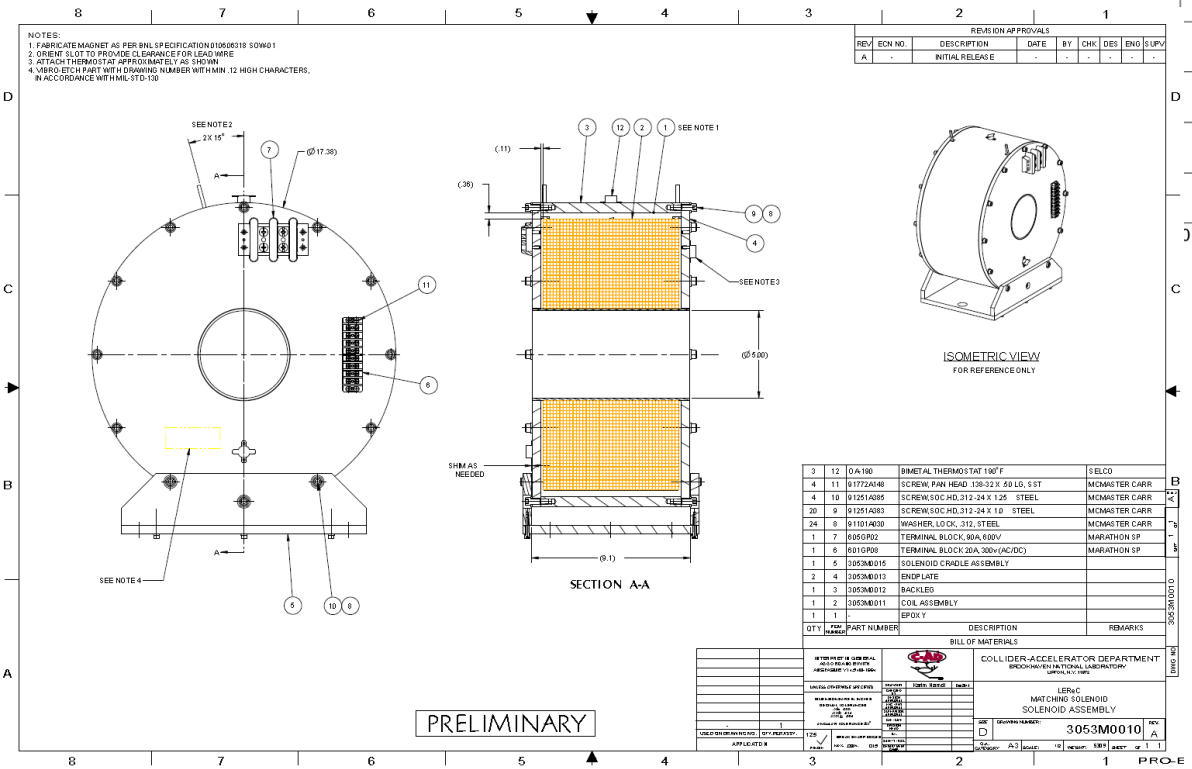
Matching Solenoids

Matching Solenoid w/corrector

- 2 required in cooling section w/o bucking coil
- Corrector 100 Gcm, will be separte
- **Complete drawings**
- **Generate SOW**

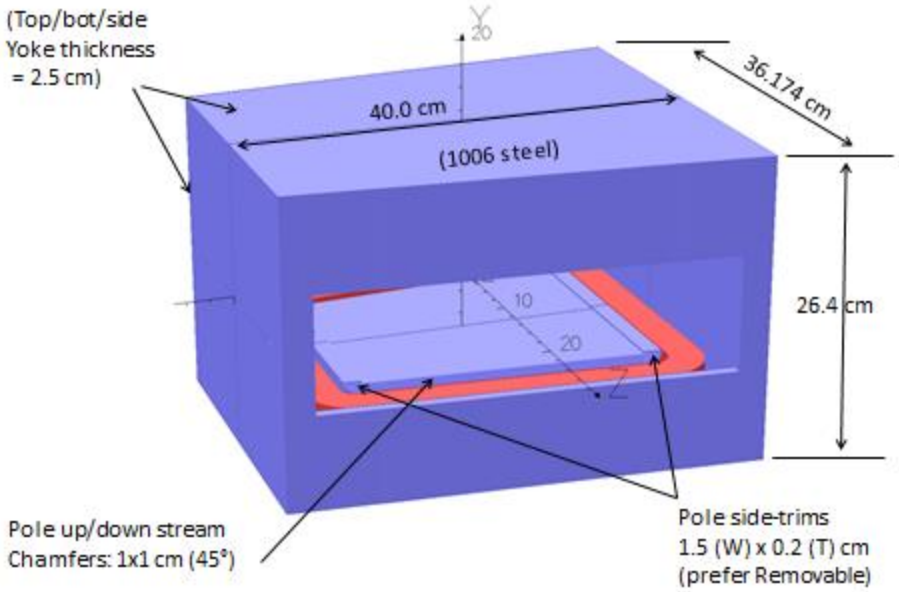
High Field Solenoid for LEReC (using solid conductor)

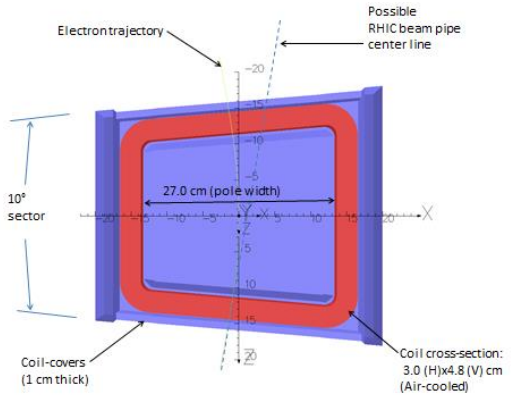




20º Dipole Magnet

LEReC 20-degree Dipole (Gap clearance=10 cm)
(distance between pole faces =10.4 cm)

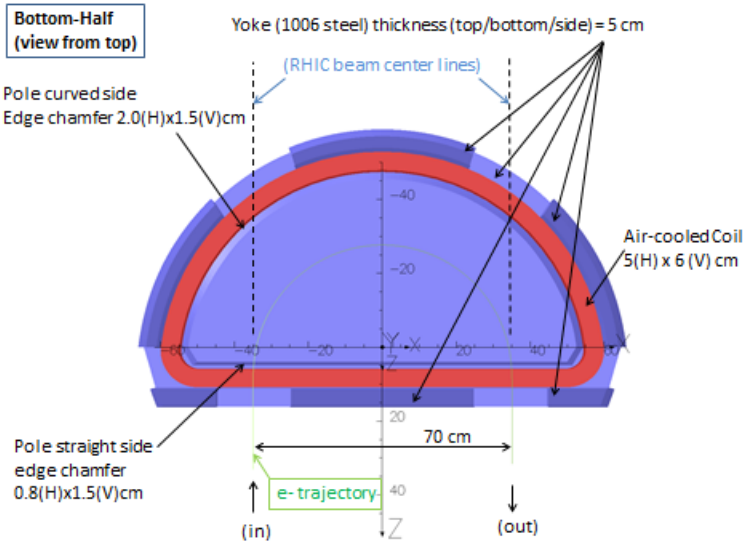


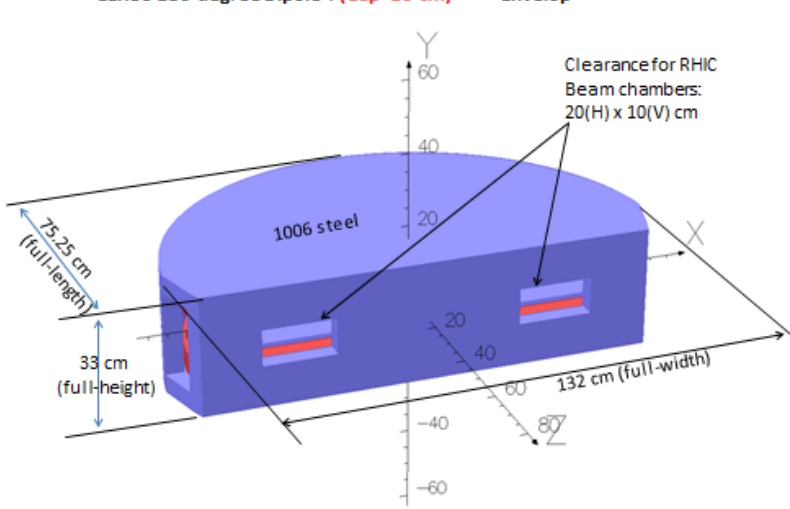


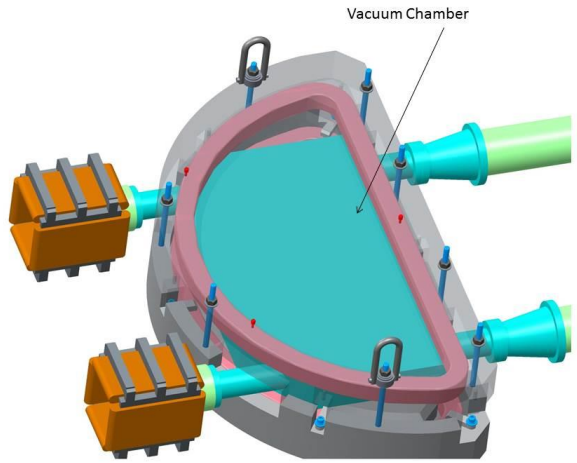
Electron tracking results and field qualities along trajectory on R=1 cm curved cylinder:

	Ek = 5 MeV	Ek = 1.6 MeV
Current per coil (Amp-turn)	1053.288	393.192
Overall current density (A/mm²) (overall coil cross-section 3.0x4.8 cm)	0.73145	0.27305
Central Gap Field (Gauss)	251.20	93.73
Half b1-integral (dipole) (G-cm)	3.1982E3	1.1930E3
Half b3-integral (6-pole) (G-cm) [Ratio to dipole integral]	1.803E-2 [5.64E-6]	7.019E-3 [5.88E-6]
Half bending angle from tracking tests (required 10°)	10.013°	10.006°

180° Dipole Magnet







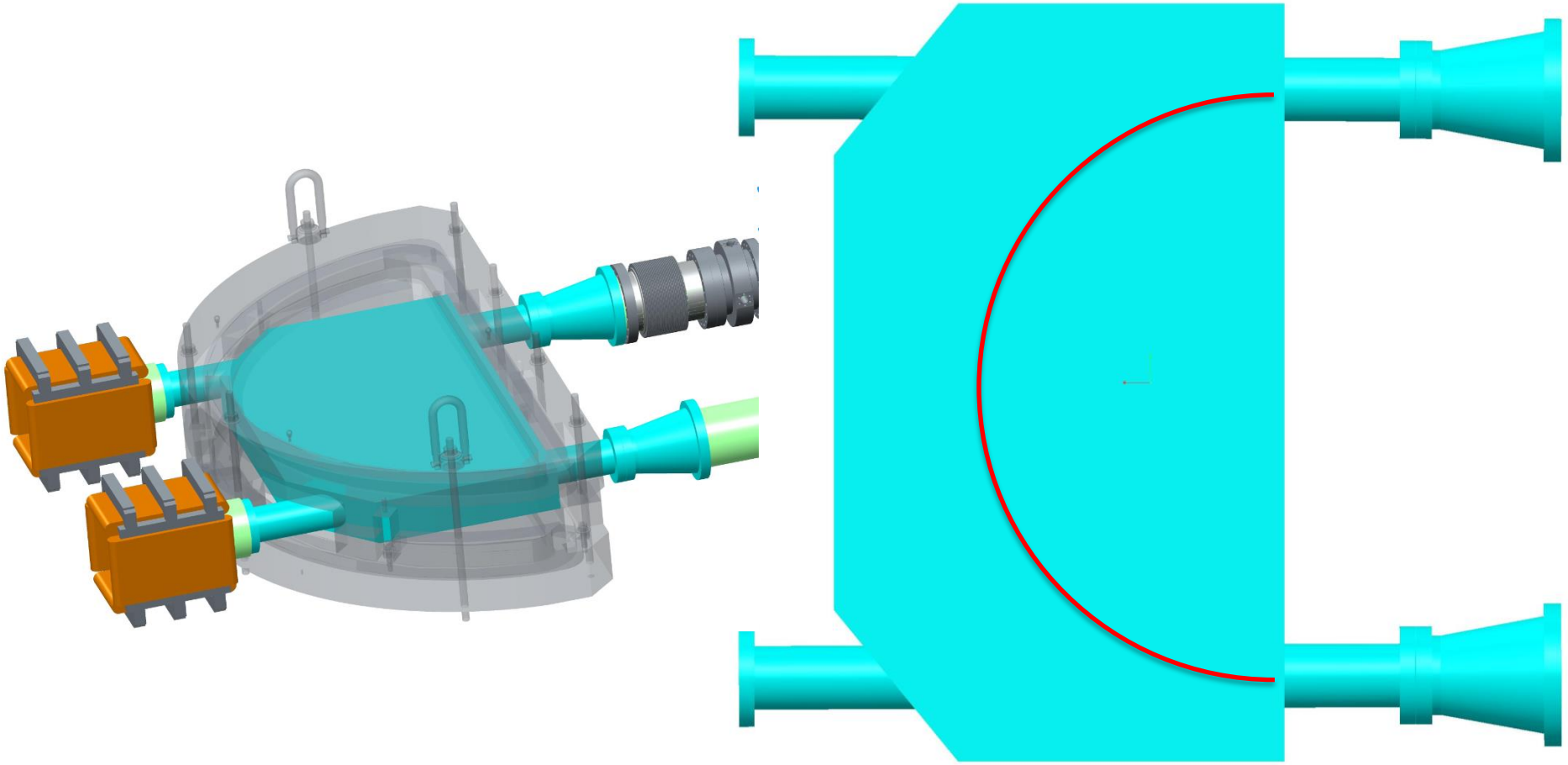
Electron tracking results and field qualities along entire trajectory on R=2 cm curved cylinder:

	Ek = 5 MeV	Ek = 1.6 MeV
Total current per coil (Ampere-turn)	2119.146	791.077
Overall current density (A/mm²) (coil-pack cross-section: 5.0 x 6.0 cm)	0.7064	0.2637
Central Field deep inside magnet (Gauss)	525.21	195.78
Effective Magnetic Length (cm)	109.43	109.57
Full b1-integral (dipole) (G-cm)	5.7471E4	2.1452E4
Full b3-integral (6-pole) (G-cm) [Ratio to dipole integral]	0.132 [2.30E-6]	0.005 [2.44E-7]
Full bending angle as shown in tracking studies (required 180°)	180.002°	180.003°

180° Dipole Magnet

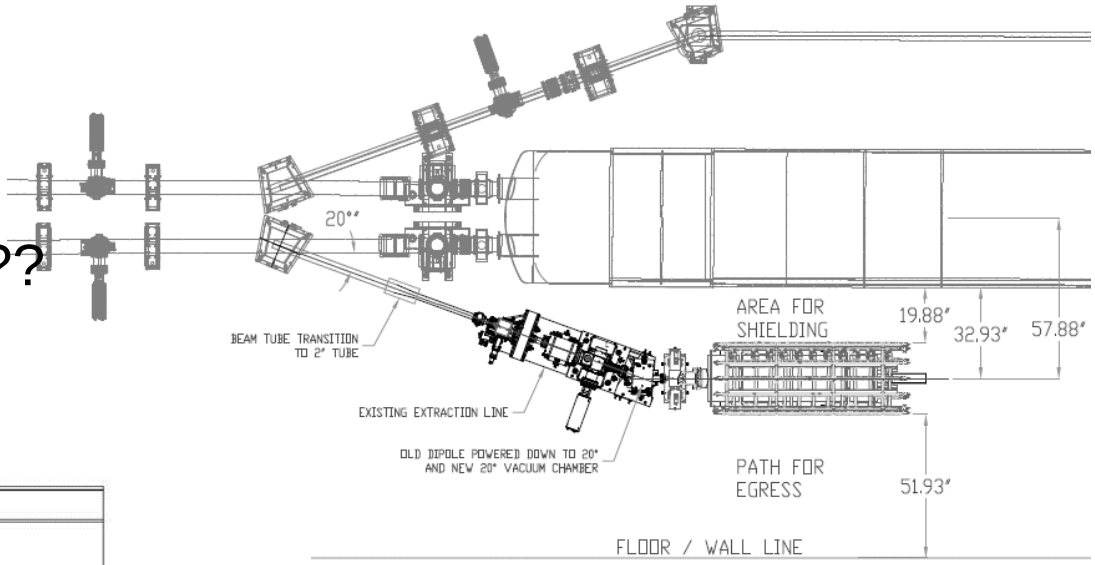
Large open 180° vacuum chamber: are there beam impedance concerns? Should the electron beam path be shielded?

Similar issue for 21° chamber?

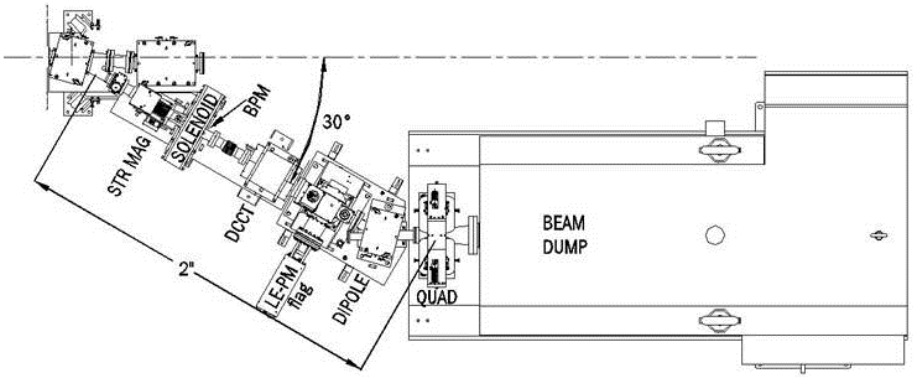


Beam Dump Line to Vacuum Valve:

(4) 20o dipoles 10 cm aperture
Or
(2) 20o dipoles 10 cm aperture
(2) 20o dipoles 6 cm aperture ??



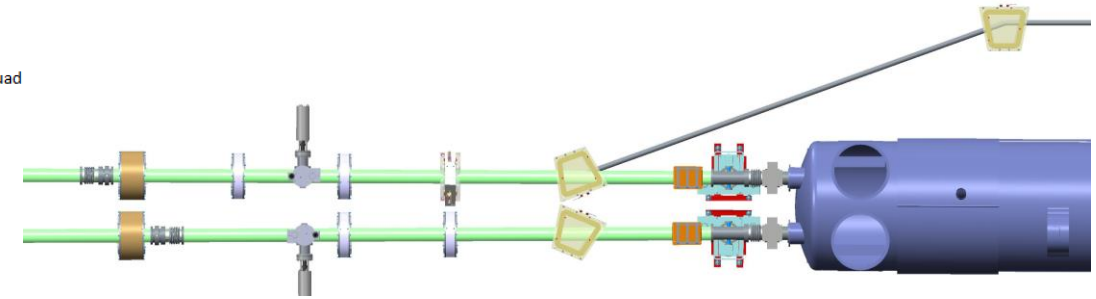
What components can we take from ERL extraction line? To be determined.



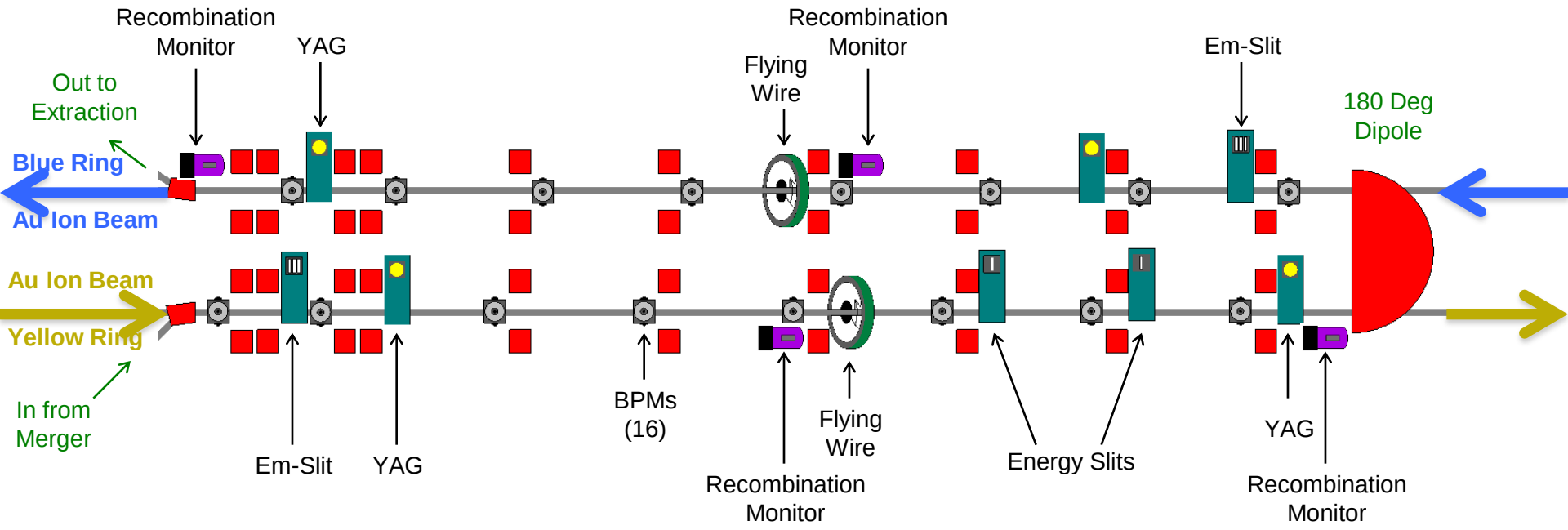
Extraction Line Components

Per Alexei, LEReC aperture is 9.0cm (3.6"). ERL BD is 4.0" dia, upstream of quad is 2.0". The solenoid and quad

GM	Extraction Dipole - 20°w/ chamber(1)	new
GM	Steering magnet (1)	new
GM	Solenoid (1)	from ERL extraction
DG/TM	BPM (1)	new
DG/TM	DCCT (1)	new
DG/TM	Profile Monitor (1)	new
GM	Dipole magnet - 20° w/ chamber (1)	new
-	Quad (1)	from ERL extraction
MM	Bellows (2)	new



Scope: Cooling Sections



Cooling Sections

BPM = 16

YAG = 4

Flying wire = 2

Emittance slits = 2

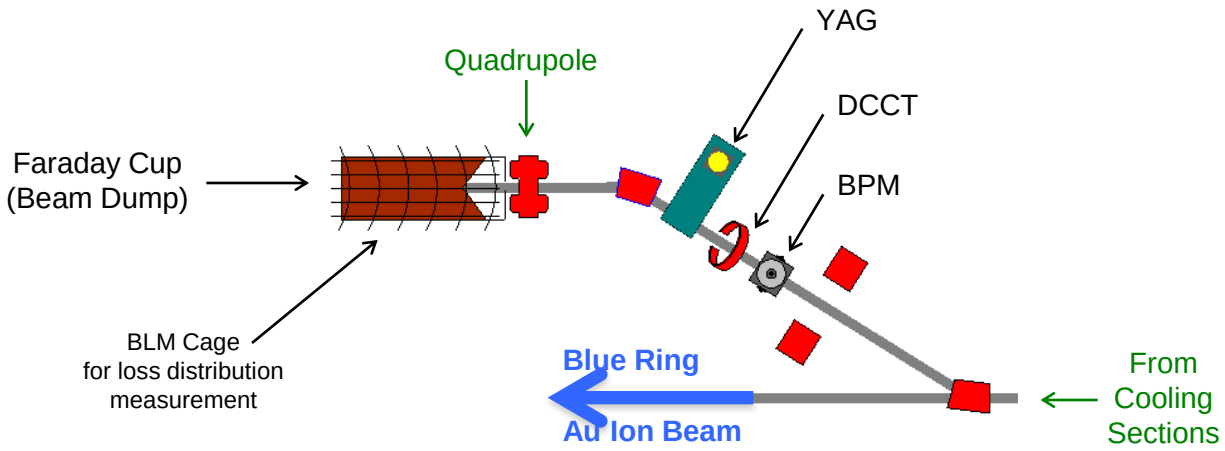
Energy Slits = 2

Recombination Mon = 4

Questions & concerns include:

- Energy Slits are 4 & 7m away from 180 deg. dipole. They can move to 4 & 1m away if one slit is built into a 3-position profile monitor. This would require a special design for the profile monitor – but this is a well known technique.
- Did we decide on 6 YAG Profile monitors AND 2 Flying Wire Scanners in the cooling section, or did the two Flying Wire Scanners replace the two middle YAG Profile Monitors?
- Do we really want the Halo Scrapers and the diagnostic beam line after the 5-Cell or should they be after the SRF Gun?
- Are all solenoids in the transport spaced 3m apart?

Scope: Extraction



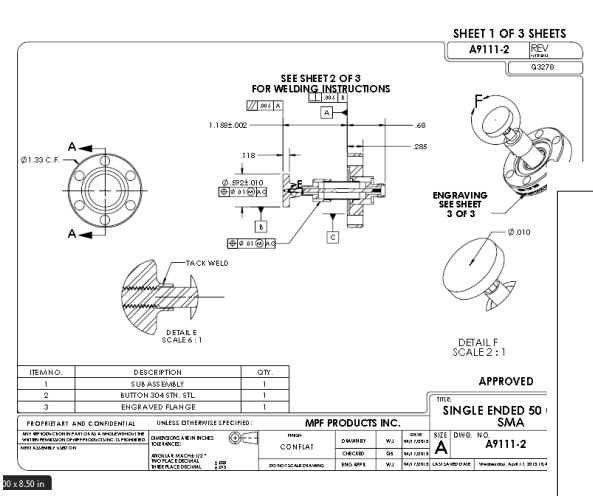
Extraction

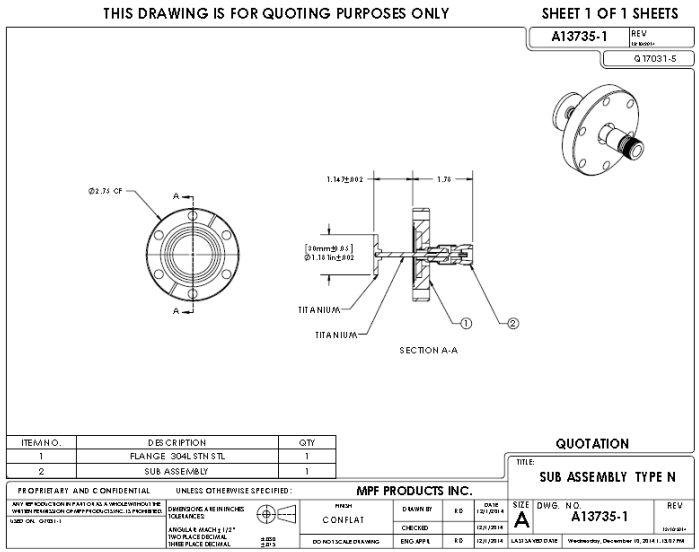
BPM = 1

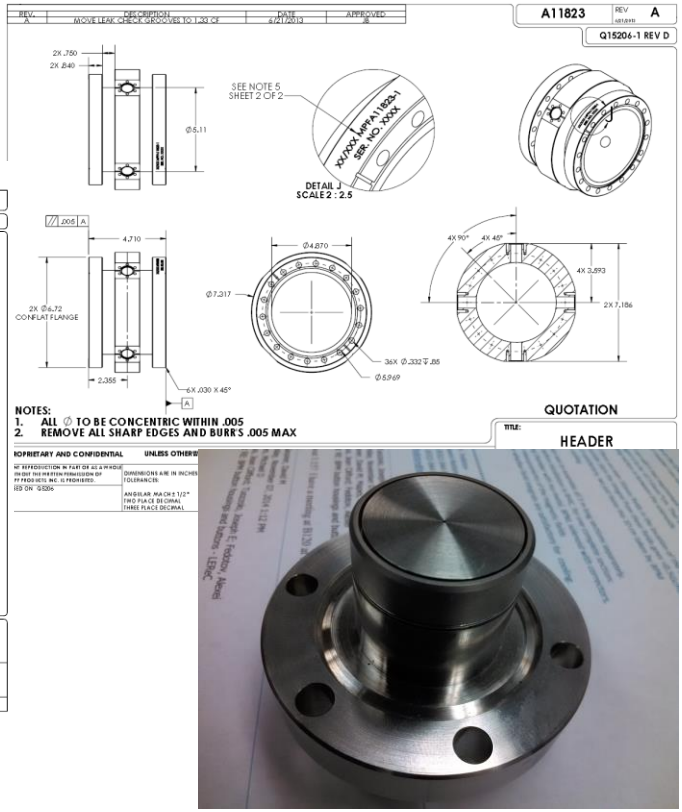
YAG = 1

DCCT = 1

Cooling Section BPM's



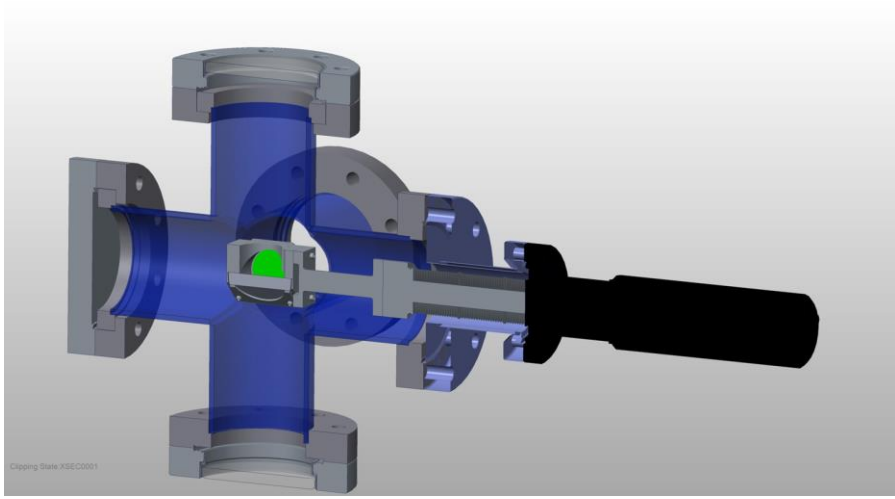


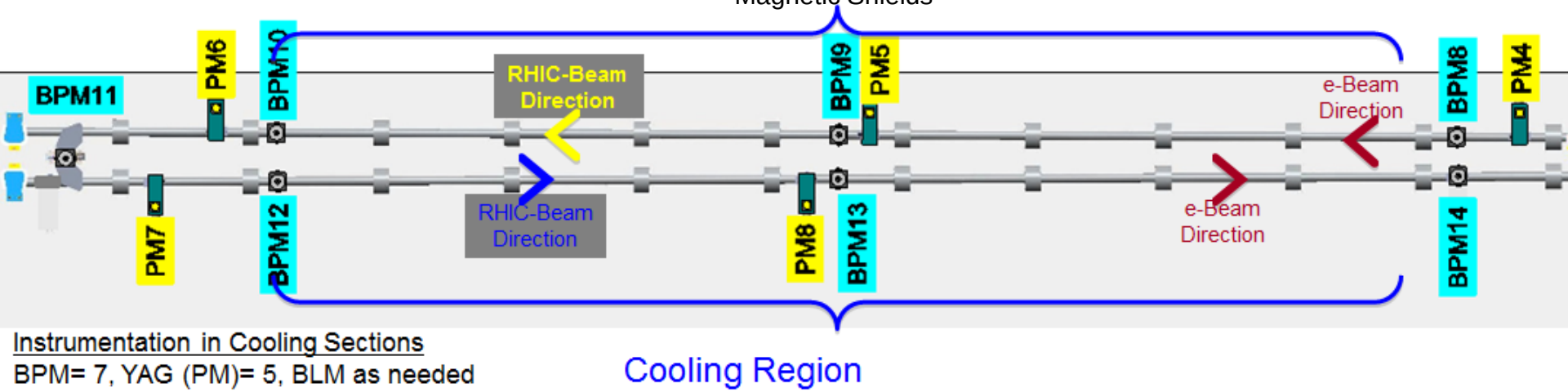


- USE MPF buttons and Vacuum Chamber for Cooling Section

Vacuum Chamber/System Requirements:

- 5” (12.7 cm) OD vacuum chamber, bake-out temperature.
- No ion pump tees in the cooling section.
- One RHIC shielded bellows per solenoid
- Transitions to 10 cm aperture dipole magnets.
- Dipole magnet vacuum chambers.
- 6 Profile Monitors, screen size??

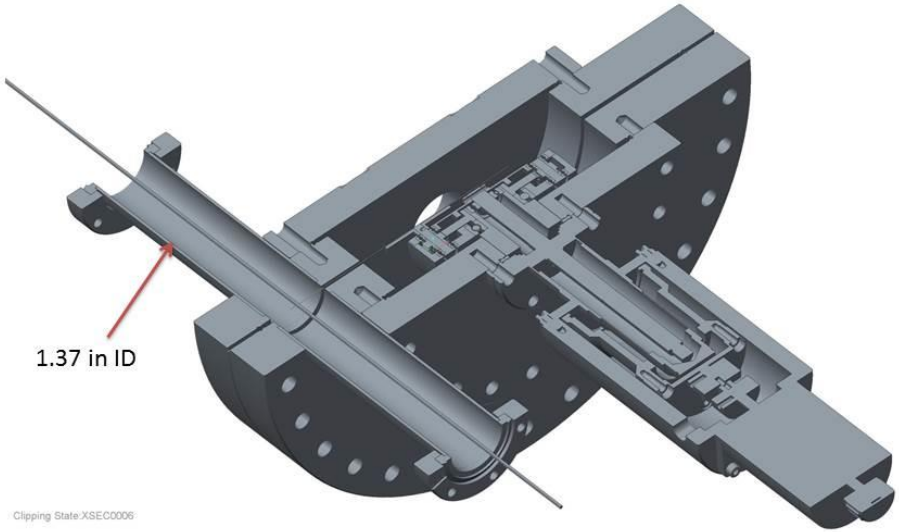




Instrumentation in Cooling Sections
BPM= 7, YAG (PM)= 5, BLM as needed

Cooling Region

Flying Wire??



Flying Wire PM